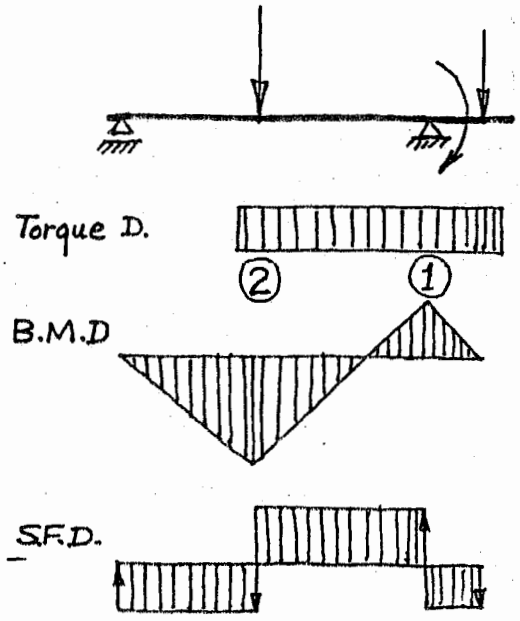
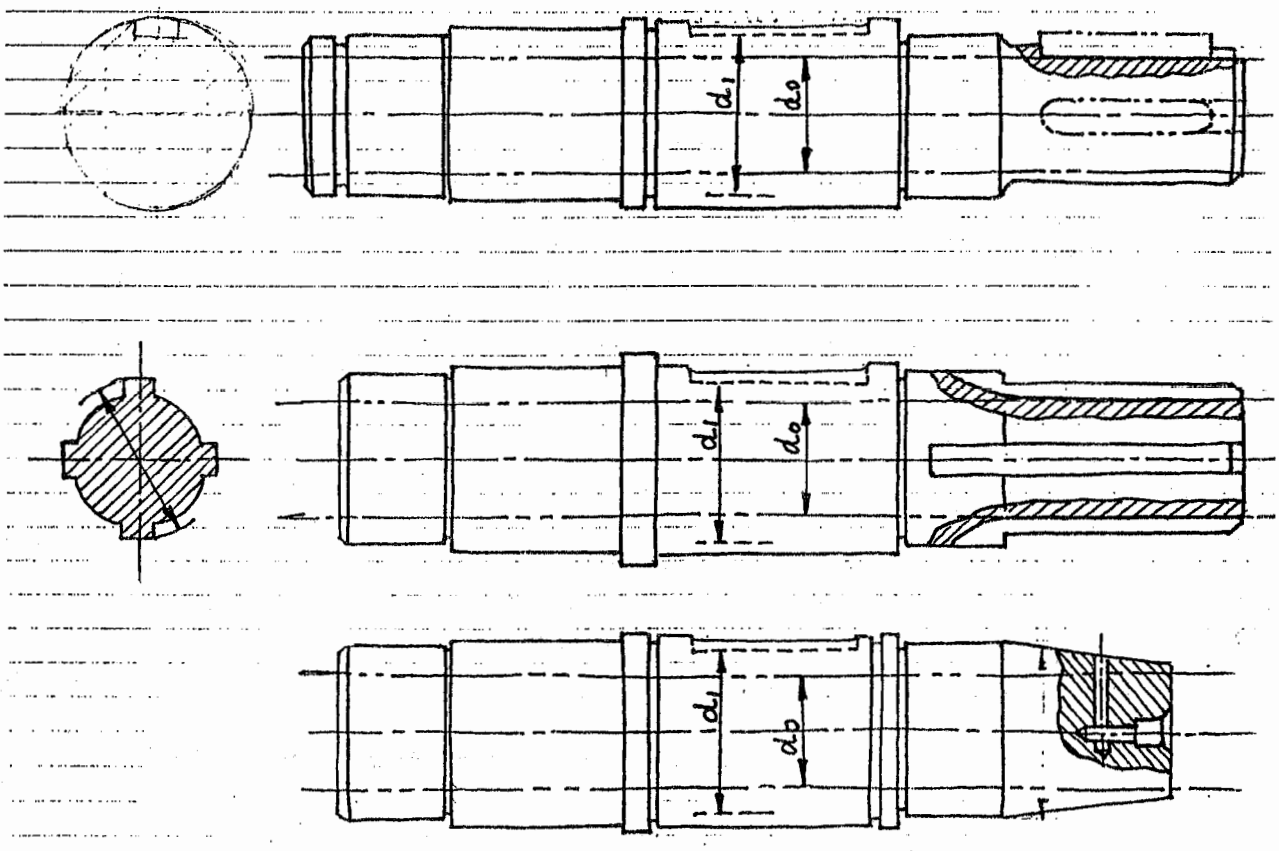
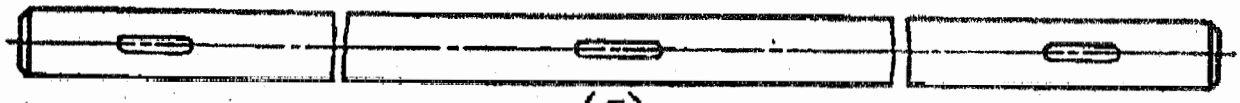
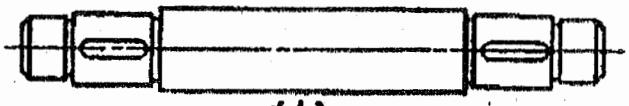

Torque D.
2
1
B.M.D
S.F.D.

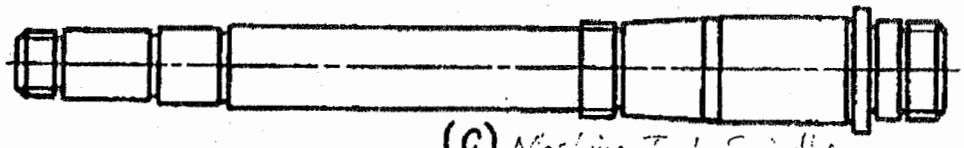

d_i
d_o
d_i
d_o
d_i
d_o



(a) Transmission shaft

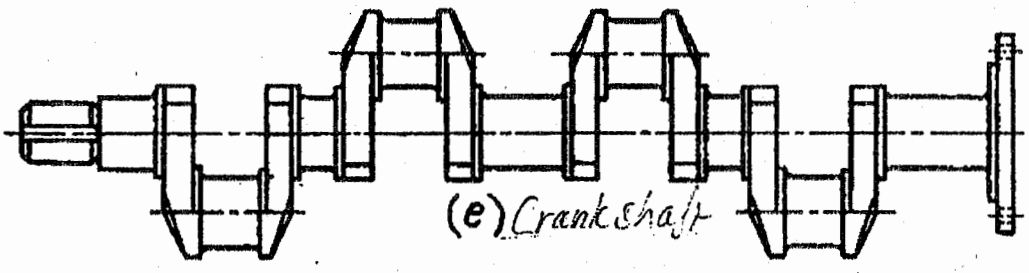


(b) Gear box shaft

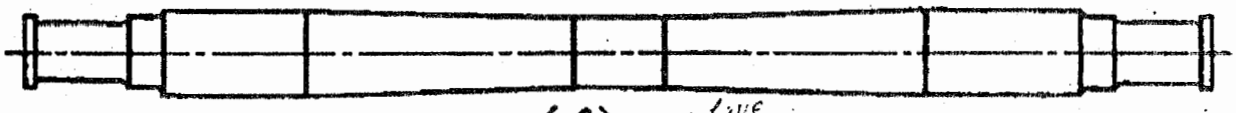


(c) Machine Tool Spindle

(d) Multistage Turbine shaft

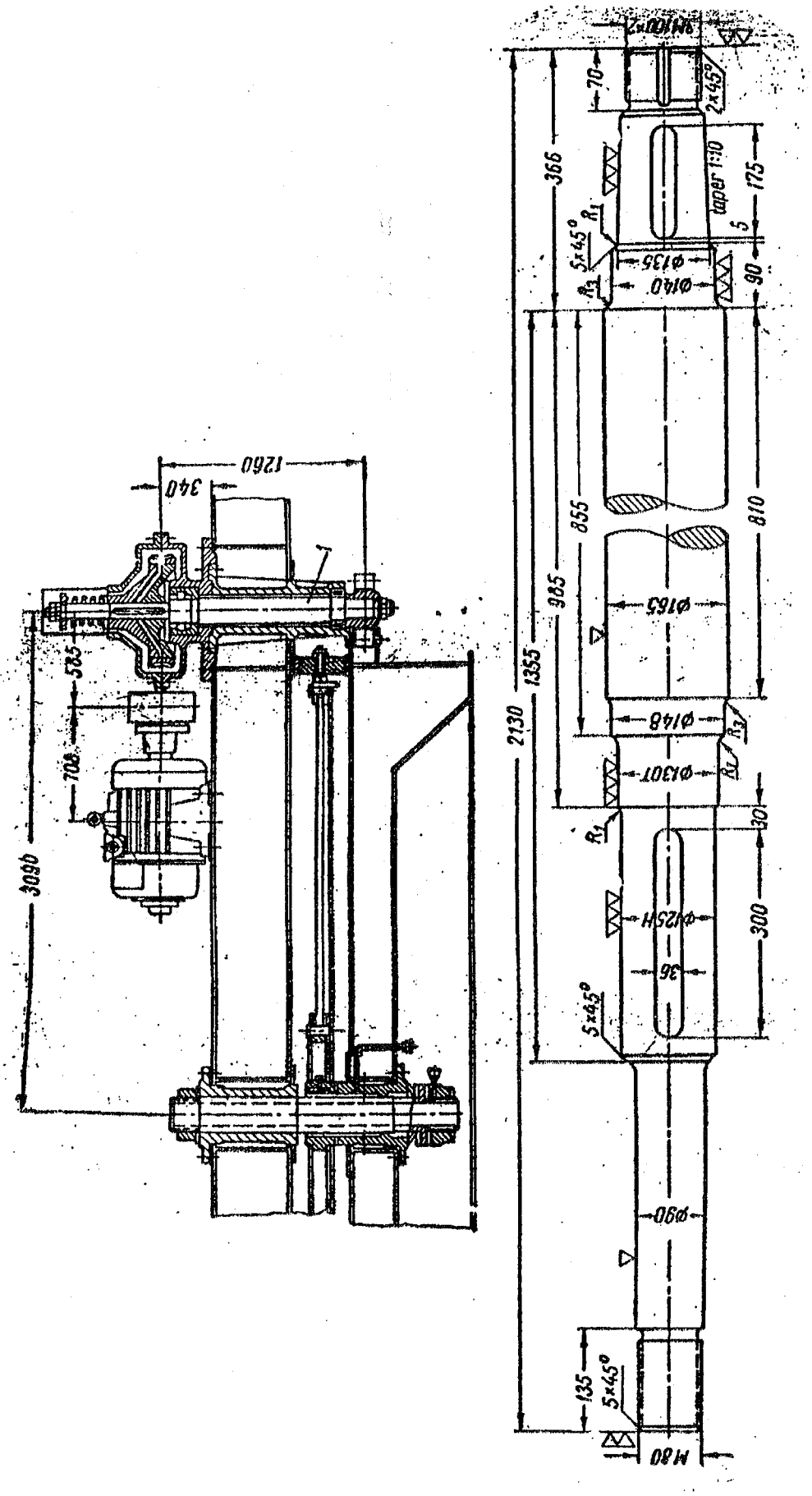


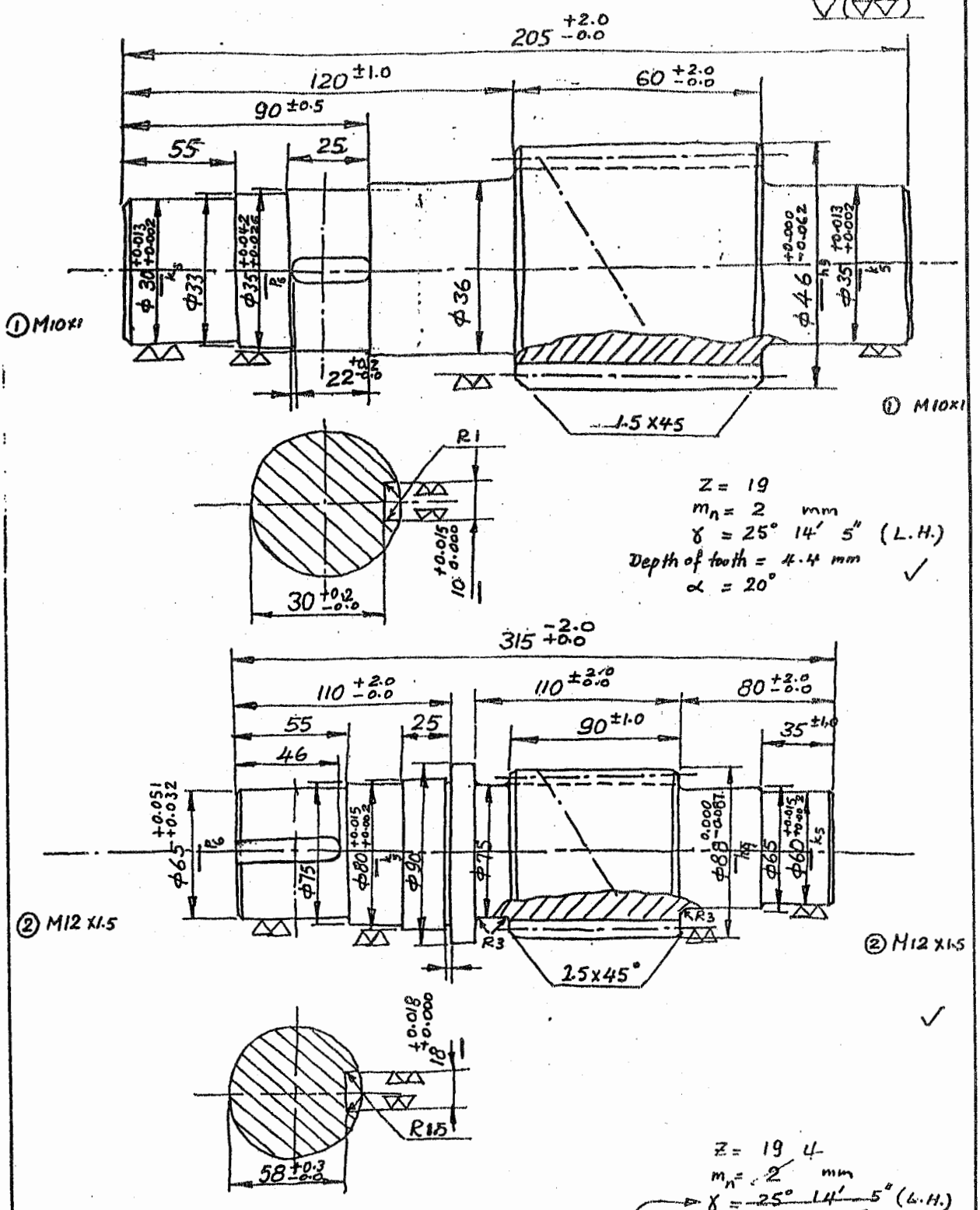
(e) Crankshaft



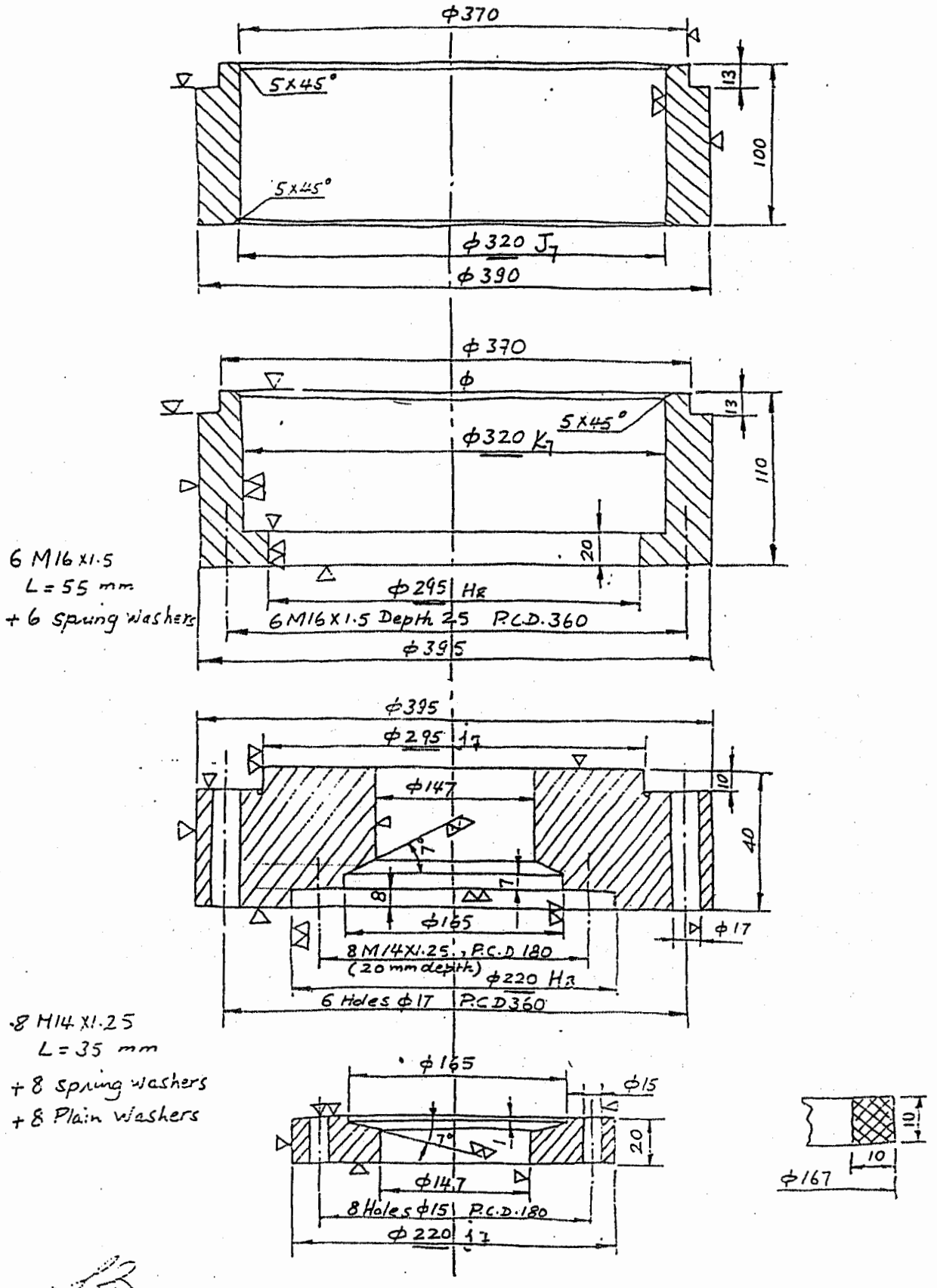
(f) Trailing axle

(g) Trailing


1260
340
585
708
3090
70
2×45°
366
taper 1:10
175
5
5×45°
R1
Ø135
Ø140
90
855
985
1355
2130
810
Ø165
Ø148
R3
Ø130T
R1
301
300
Ø125H
36
5×45°
Ø90
135
5×45°
M80

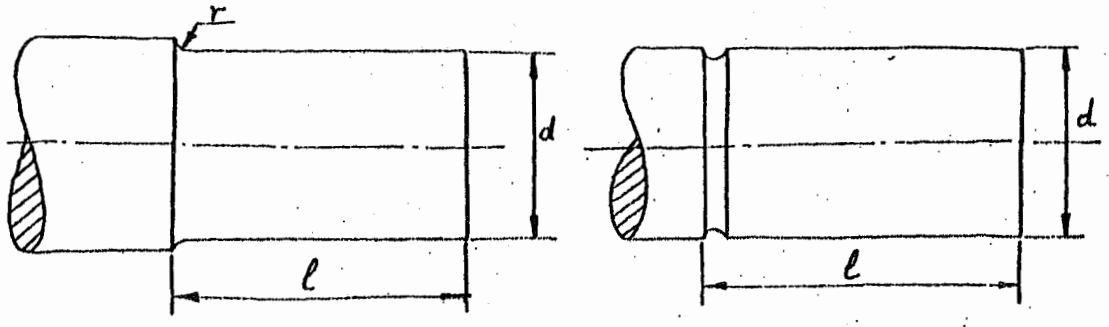


Non tolerated diam. to be ± 0.2 mm


φ370
5×45°
5×45°
13
100
φ320 J7
φ390
φ370
φ
5×45°
φ320 K7
13
110
20
φ295 H8
6 M16×1.5 Depth 25 P.C.D.360
φ395
6 M16×1.5
L = 55 mm
+ 6 Spring Washers
φ395
φ295 J7
φ147
10
40
7°
8
7
φ165
φ17
8 M14×1.25, P.C.D 180
(20 mm depth)
φ220 H8
6 Holes φ17 P.C.D360
8 M14×1.25
L = 35 mm
+ 8 Spring Washers
+ 8 Plain Washers
φ165
φ15
7°
20
φ147
8 Holes φ15 P.C.D.180
φ220 J7
10
10
φ167

Shaft end:

1. Straight ends:-



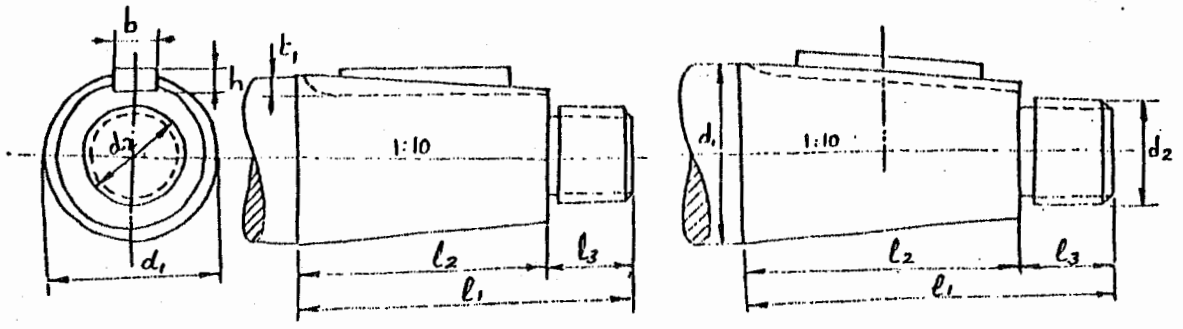
DIN 748 T1 (Jan 1970):

d mm	16	19	20	22	24	25	28	30	32	35
l mm L.	40	40	50	50	50	60	60	80	80	80
l mm S.	28	28	36	36	36	42	42	58	58	58
r ≤	0.6	0.6	0.6	0.6	0.6	1.0	1.0	1.0	1.0	1.0

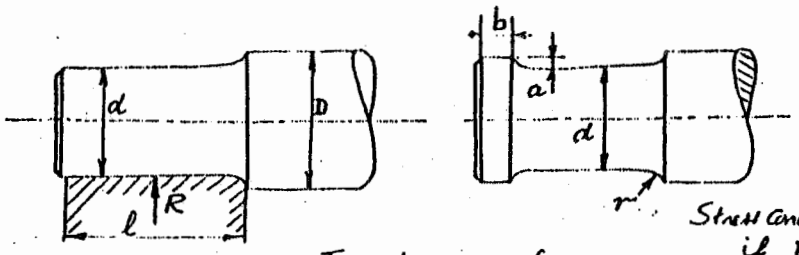
d. mm	38	40	42	45	48	50	55	60,65 70,75	80,85 90,95	100,110 120
l mm L.	80	110	110	110	110	110	110	140	170	210
l mm S.	58	82	82	82	82	82	82	105	130	165
T ≤	1.0	1.0	1.0	1.0	1.0	1.6	1.6	1.6	1.6 2.5	2.5

Taper ends:

DIN 1448 T1 (Jan. 1970)

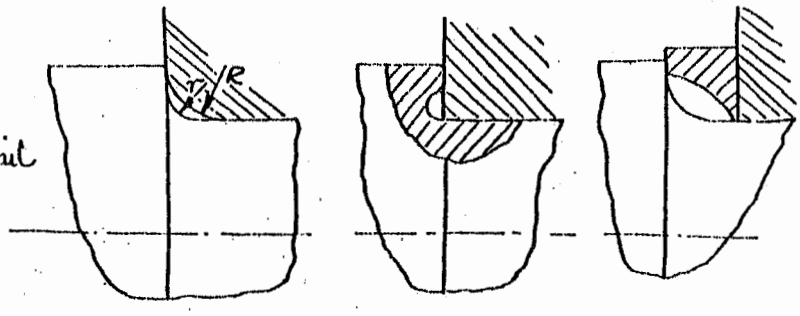


Shaft diam. d_1 mm.	Thread diam. d_2	l_1		l_2		l_3
		Long	Short	Long	Short	Long or Short
16 19	M 10 x 1.25	40	28	28	16	12
20 22 24	M 12 x 1.5	50	36	36	22	14
25 28	M16 x 1.5	60	42	42	24	18
30 32 35	M20 x 1.5	80	58	58	36	22
38 40 42	M24 x 2	110	82	82	54	28
45 48	M30 x 2					
50 55	M36 x 3					

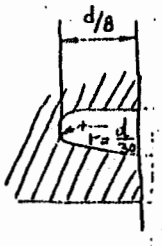


Stress concentration factor = 1.0 if $r \geq 0.1d$

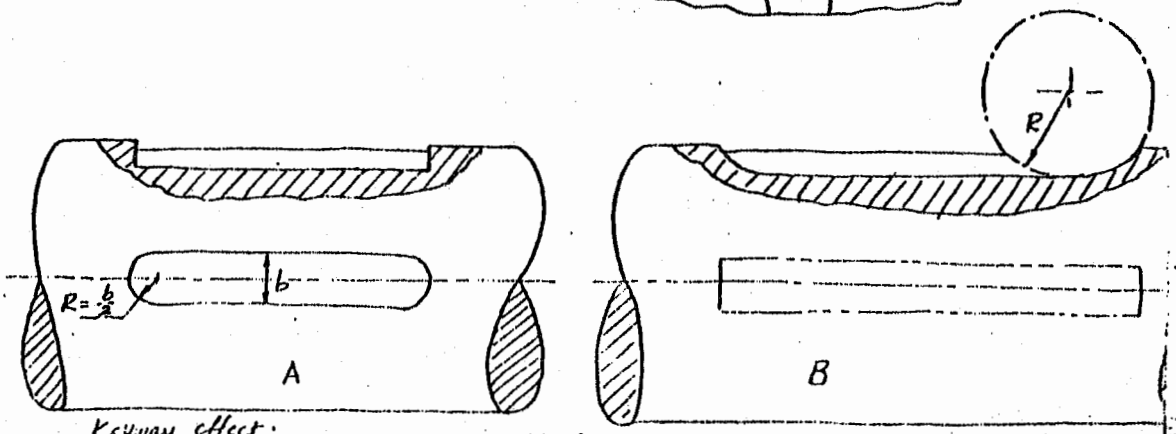
Journal at shaft end



Mounting detail



Flexible hui



Keyway effect:
Stress concentration in B is 30% less than that in A.

Undercuts

DIN 509

Freistiche

From size 0.6 × 0.2 upwards, undercuts of Type E and F can be produced by copying methods.
For details of earlier Types A, B, C and D (not to be used for new designs), see page 3.

Dimensions in mm

The dimensions given in the Tables apply to the finished component.
The illustrations show outside undercuts on turned parts.

Type E for workpieces with one machined surface

Type F for workpieces with two machined surfaces at right angles to each other

z = Machining allowance
d_1 = Finished dimension

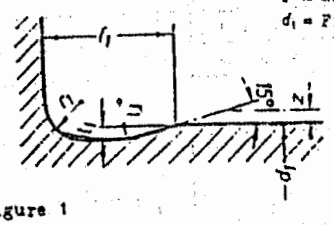


Figure 1

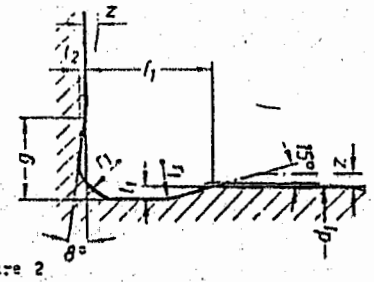


Figure 2

Designation of an undercut of Type E of radius r_1 = 0.6 mm and depth t_1 = 0.2 mm:

Undercut E 0.6 × 0.2 DIN 509

Table 1

r_1	l_1 +0.1	l_1	g ≈	t_2 +0.05	reproducible by copying	recommended correlation to diameter d_1 [1]) for workpieces: for normal duty conditions	with increased fatigue resistance
0,1	0,1	0,5	0,8	0,1	no	to 1,6	–
0,2	0,1	1	0,9	0,1		above 1,6 to 3	
0,4	0,2	2	1,1	0,1		above 3 to 10	
0,6	0,2	2	1,4	0,1	yes	above 10 to 18	–
0,6	0,3	2,5	2,1	0,2		above 18 to 80	
1	0,4	4	3,2	0,3		above 80	
1	0,2	2,5	1,8	0,1	yes	–	above 18 to 50
1,6	0,3	4	3,1	0,2			above 50 to 80
2,5	0,4	5	4,8	0,3			above 80 to 125
4	0,5	7	6,4	0,3			above 125

Finish: ▽▽, alternative surface qualities are to be specially indicated in the designation, e.g.
Undercut E 1 × 0.2 DIN 509 – ▽▽▽

[1]) The correlation to various diameter ranges does not hold good when short projections and thin-walled parts are involved.
When a workpiece has different diameters, it may be convenient for production reasons to use the same shape and size of runout at several points.

For undercuts for screw threads, see DIN 76
For blending features as fitting dimensions for ball and roller bearings, see DIN 5418

Continued on pages 2 and 3
Explanations on page 4

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Countersink in the companion part

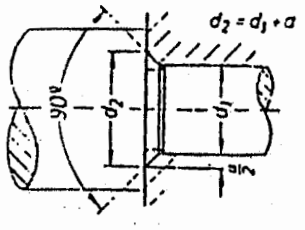


Figure 3

Table 2

Undercut size $r_1 \times t_1$	a Maximum Type E	a Maximum Type F
0,1 × 0,1	0	0
0,2 × 0,1	0,2	0
0,4 × 0,2	0,4	0
0,6 × 0,2	0,8	0,2
0,6 × 0,3	0,6	0
1 × 0,2	1,6	0,8
1 × 0,4	1,2	0
1,6 × 0,3	2,6	1,1
2,5 × 0,4	4,2	1,9
4 × 0,5	7	4,0

Effect of machining allowance on Type E and F

The machining allowance z displaces the blend of the undercuts into the machined surfaces by the amount e_1 and e_2 respectively.

This amount depends on the size of the machining allowance z and on the entering and leaving angles at the undercut.

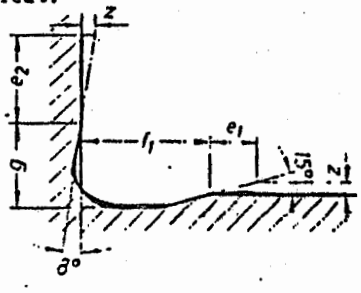


Figure 4

Table 3

z	e_1	e_2
0,1	0,37	0,71
0,15	0,56	1,07
0,2	0,75	1,42
0,25	0,93	1,78
0,3	1,12	2,14
0,4	1,49	2,85
0,5	1,87	3,56
0,6	2,24	4,27
0,7	2,61	4,98
0,8	2,99	5,69
0,9	3,35	6,40
1,0	3,73	7,12

Method of representation and detailing of undercuts in drawings

Undercuts shown in drawings can either be drawn in full and dimensioned or shown in simplified form with the appropriate designation.

Example: Undercut Type F of radius r_1 = 1 mm and depth t_1 = 0.2 mm

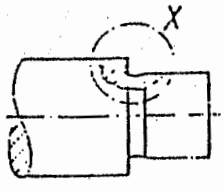


Figure 5

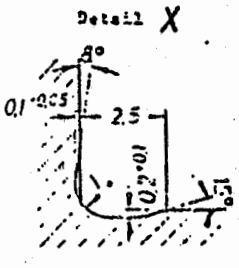


Figure 6

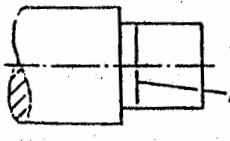
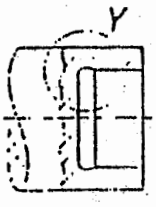


Figure 7

Example: Undercut Type E of radius r_1 = 1 mm and depth t_1 = 0.2 mm



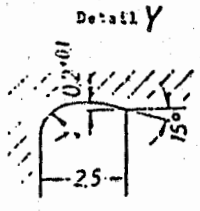
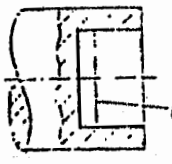
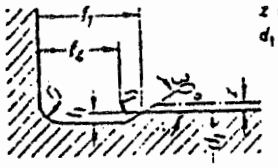


Figure 8



Undercuts [illegible] are not to be used for new designs. As they are not [illegible] methods, they have to be made by means of form tools. The dimensions of these types are given here because they are referred to in existing production documents.

Type A for workpieces with one machined surface



x = Machining allowance
d_1 = Finished dimension

Figure 9

Type B for workpieces with two machined surfaces at right angles to each other

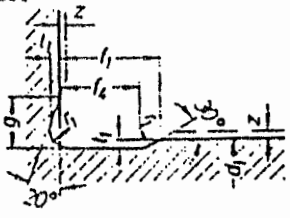


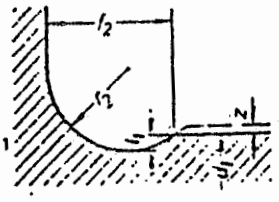
Figure 10

Designation of an undercut of Type B of width f_1 = 4 mm and depth t_1 = 0.3 mm:
Undercut B 4 × 0.3 DIN 509

Table 4

f_1	f_1	gen. var.	f_4	g ≈	r_1
1	0,1	+0,05	0,8	0,5	0,2
2	0,2	+0,1	1,5	1	0,4
4	0,3		3,3	1,5	0,6
6	0,4		5	2,3	1

Type C for workpieces with one machined surface



x = Machining allowance
d_1 = Finished dimension

Figure 11

Type D for workpieces with two machined surfaces at right angles to each other

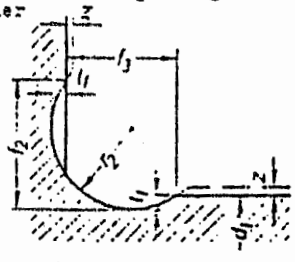


Figure 12

Designation of an undercut of Type C of radius r_2 = 1 mm and depth t_1 = 0.2 mm:
Undercut C 1 × 0.2 DIN 509

Table 5

r_2	f_1 +0,1	f_2 ≈	f_3 ≈
1	0,2	1,6	1,4
1,6	0,3	2,5	2,2
2,5	0,3	3,7	3,4